Jan 2, 03
OFA Control Meeting
Bill Morgan
Ken Nilsen
Jan Nelson

Babcock Power, Inc.
Worcester, MA

Air Supply on 9th floor. for Controls ?
Jerry F.
Probe-air similar to PA pitot

Control of Overfire Air
For
Intermountain Power - Unit 2
850 West Brush Wellman Road
Delta, Utah

Babcock Power Inc. Contract 100210

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Description if the Overfire Air (OFA) System and Control Devices.

The overfire air system consists of new rows of OFA ports located above the top burner elevation, front and rear of the boiler. There are two sets of ports with a relative area split of 1/3 and 2/3. The 1/3 ports over the 2/3 ports, and both located directly above each of the six burner columns. Similar sets of two ports, the "wing ports", are located beyond the burner columns, close to the side walls of the boiler, for a total of 8, 1/3 ports and 8, 2/3 ports on the front and the same on the rear side of the boiler.

Sets of four, either 1/3 or 2/3 port dampers, are connected together (ganged) by means of linkages so that the four port dampers of the same kind are operated simultaneously by means of a single Jordan rotary electrical damper operator. There are then a total of four damper drives on the front and four on the rear of the boiler.

The linkages as well as the ducts that form the 1/3 and the 2/3 ports are all internally located in OFA crossover ducts, front and rear. The crossover ducts are fed by four OFA feeder ducts connected to the air plenums that convey secondary air to the burner elevations on the left and right sides of the unit.

The damper drives that operate the 1/3 damper trains are Jordan SM-5120 series, powered by single phase, 120 VAC and furnished with remotely located servo-amplifiers capable of receiving 4-20 mA demand signals and providing 4-20 mA position signals for the Purchaser's use.

The damper drives that operate the 2/3 damper trains are higher torque Jordan SM-5220 series with the same characteristics as the 1/3 port damper drives.

Each of the OFA "feeder" ducts at each corner of the unit is provided with manually operated balancing dampers. There is also an Air Monitor Corporation array of three VOLU-probes and thermocouples to measure OFA mass flow on each of the feeder

ducts. Each array is provided with a CAMM "Smart" mass flow transmitter and "Combustion Air Management System" (CAMS) to provide automatic compressed air purge to the VOLU-probes.

Description of the Proposed Control Strategy.

Note: All boiler load setpoint values and OFA to secondary air ratio setpoint curve, described below, are initial values. These values will be revised based on the results of the commissioning performance tests. Please refer to documentation to be provided by BPI.

Overfire air is used to control NOx formation and is generally required at higher boiler loads (above 60%). OFA flow is accomplished by the combination of two actions.

Firstly, by the programmed opening of the OFA ports of one kind or the other in the pattern described below in this description. The OFA port dampers are not modulating and are to be operated either fully open or fully closed (except for biasing of the open position to achieve balance O2 or NOx distribution on the back end of the boiler).

Secondly, by forcing secondary airflow to the OFA system. This is attained by simultaneously and identically decreasing the opening of all the combustion air dampers feeding each of the burner elevations. This decrease is to be superimposed on the existing automatic control biasing of each elevation combustion air in accordance with its pulverizer load.

Because of the very low available air pressure in the secondary air plenums feeding both the OFA ports and the burners, it is anticipated that the dampers located in the OFA feeder ducts will not be effective for modulation control (fully open they will not be able to establish the required OFA flow). These dampers are to be used only for the local, manual side to side balance of the OFA crossover ducts. After initial commissioning these dampers will be locked in place.

Mechanical interference in the crowded OFA areas and limited space make it impossible to ideally locate the air flow monitors upstream of the balancing dampers. These monitors will be mounted in short straight runs of duct downstream of these dampers. However, these dampers will be permanently open (except for the slight bias required for balancing) and, in addition, they are of the opposed blade design. These design conditions will minimize flow pattern disturbance. Furthermore, it should be pointed out that very accurate OFA flow measurement is not necessary to attain effective OFA control.

Automatic and simultaneous biasing of all the secondary air modulating dampers at each burner elevation, so that they attain a closer position than at present, will be used to divert air to the OFA system.

The above effect will be accomplished by a new control loop, provided, designed in detail and implemented by the Purchaser in its combustion control system. This control loop will have, as process variable; the ratio of the total measured OFA flows to the existing measured total secondary air; and as the setpoint, the desired ratio of these two air flows. This ratio is not constant and is derived by BPI as a function of total boiler load.

A/B

This secondary air damper control is additive to the existing bias required to change burner airflow in proportion to the individual pulverizer load. The action of the sum of both biases will result in less secondary air directly to the burners, as OFA is being introduced, but the relative secondary air distribution between burner elevations will remain unchanged.

Note: BPI will provide a setpoint curve showing the desired ratio of OFA flow to secondary airflow as a function of boiler load. These values will be confirmed or revised by actual tests.

Note: There shall be agreement between this setpoint curve and the actual airflow measurements: i.e. it shall be decided by the purchaser and BPI if the ratio is based on OFA to secondary air only or OFA to total combustion air, which includes primary air, based on current measurement availability.

PA + SA

The operator can also select a constant setpoint for commissioning or test purposes. Either setpoint is limited to the expected maximum range of OFA to total airflow ratio (i.e. 0 to 20%).

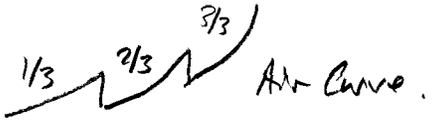
Figure 1 describes this control loop in general terms.

The OFA port relative open area sizes, 1/3 and 2/3, are calculated to provide the correct velocity of the OFA to attain the proper penetration of the OFA into the combustion region of the furnace above the burners. For this reason it is not recommended to modulate the OFA port dampers since changes in the damper position will affect the penetration velocity. All ports of a given kind: 1/3 or 2/3, will open or close following a program designed to open the correct area to roughly produce the proper penetration velocity as the OFA air flow rate changes with boiler load. The initial program is as follows:

Nelson disagrees.

0 to 60% boiler load:	All 1/3 and 2/3 ports closed
60 to 75% boiler load:	1/3 ports open, 2/3 ports closed
75 to 90% boiler load:	1/3 ports closed, 2/3 ports open
90 to 100% boiler load:	1/3 ports open, 2/3 ports open

An individual manual/automatic and bias station per port group damper drive is recommended.



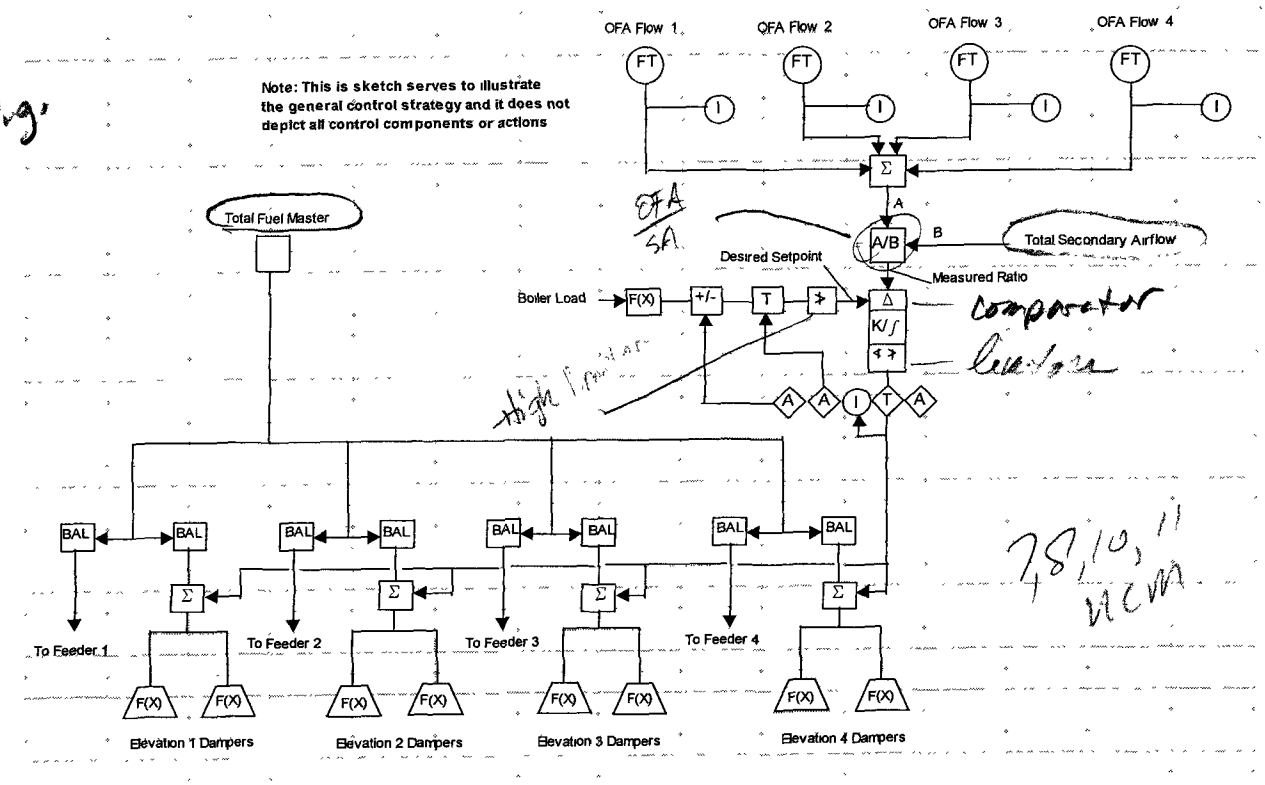


Fig 1

Windbox & SA damper now to be tied together (via controls). Not currently set-up that way.